

APPENDIX C

LABORATORY TEST RESULTS FOR OIL SAMPLES FROM WELLS EE-11 AND BR-I AND GROUNDWATER SAMPLE FROM WELL BR-G

- C.1 Physical Properties and Chemical Composition of Oil Sample from Well EE-11
- C.2 Physical Properties and Chemical Composition of Oil Sample from Well BR-I
- C.3 Chemical Composition of Groundwater Sample from Well BR-G

**APPENDIX C.1
PHYSICAL PROPERTIES AND CHEMICAL COMPOSITION OF
OIL SAMPLE FROM WELL EE-11**

C.1 Physical Properties and Chemical Composition of Oil Sample from Well EE-11
(2 pages)

Table C-1: Chemical Composition of Oil Sample from Well EE-11 (5 pages)

Physical properties testing results from PTS Laboratories (3 pages)

ASTM D86 Distillation Test results from SPL, Inc. (2 pages)

High Temperature Simulated Distillation (HTSD) results from Triton Analytics Corp.
(10 pages)

C.1 PHYSICAL PROPERTIES AND CHEMICAL COMPOSITION OF OIL SAMPLE FROM WELL EE-11

On May 19, 2004, personnel from Groundwater Services, Inc. (GSI) collected a sample of oil from well EE-11, which is located at Site G. The oil was reported to have dark brown color and the consistency of motor oil. Results of field measurements indicated a specific gravity of 0.94 and viscosity of 26.9 centistokes at a temperature of 78 °F. The specific gravity measurement and visual observations confirmed that the oil is an LNAPL.

Two 40-mL vials of the oil sample from EE-11 were submitted to Severn Trent Laboratories in Savannah, Georgia, for laboratory analysis of VOCs, SVOCs, pesticides, herbicides, PCBs, dioxins/furans, and metals. Analytical results are presented on Table C-1 and summarized below. Less than one percent of the sample composition by weight was identified by these analytical methods. Copies of laboratory reports are attached.

Chemical Constituents in Oil Sample from EE-11	Reported Concentration (mg/kg)	Weight Fraction (%)
VOCs (total)	829	0.083
SVOCs (total)	3300	0.33
Pesticides (total)	153	0.015
Herbicides (total)	31	0.003
PCBs (total)	2600	0.26
Dioxins/Furans (total)	32 *	0.003
Metals (total)	1580	0.16
Total Weight Fraction for Identified Constituents:		0.85%
* = Neither 2,3,7,8-TCDD nor 1,2,3,7,8-PeCDD was detected in the oil sample.		

A liter bottle containing groundwater and oil was submitted for laboratory analysis of fluid properties at PTS Laboratories in Santa Fe Springs, California. The sample was tested using ASTM D445 and ASTM D1481, which include measurement of: i) dynamic viscosity and fluid density at three temperatures; ii) surface tension for each fluid; and iii) interfacial tension for oil/water, oil/air, and water/air. Results of laboratory testing of the LNAPL sample indicated a specific gravity of 0.89 and viscosity of 26.4 centistokes at a temperature of 70 °F.

An additional volume of sample was submitted to SPL, Inc. of Houston, Texas, for analysis by ASTM Method D86 Distillation. Initial boiling point of the oil was 517 °F, and final boiling point was 700 °F, at which temperature the sample experienced decomposition.

A liter of oil and water was retained under refrigeration by GSI. A vial of oil taken from the liter bottle was submitted to Triton Analytics Corporation of Houston, Texas, on

August 9, 2004 for High Temperature Simulated Distillation (HTSD). The HTSD test is a GC technique that separates individual hydrocarbon components in the order of their boiling points, giving a percent mass yield as a function of boiling point. The HTSD test can be used to determine the carbon number distribution up to C120.

Prior to conducting the HTSD test, Triton Analytics centrifuged the contents of the vial for ten minutes to isolate the oil layer. Triton Analytics reported that the boiling characteristics of the oil layer from the sample showed a significant amount of hydrocarbon compounds in the diesel range. A minor second boiling region of material was observed in the C23 carbon number range, which is more characteristic of a vacuum gas oil or heavier oil.

Key Findings: The oil sample collected from well EE-11 was determined to be an LNAPL. Chemical constituents identified by various analytical methods comprised less than one percent of the sample by weight. The boiling characteristics of the oil sample showed a significant amount of hydrocarbon compounds in the diesel range. A minor second boiling region of material was observed in the C23 carbon number range, which is more characteristic of a vacuum gas oil or heavier oil.

TABLE C-1
 CHEMICAL COMPOSITION OF OIL SAMPLE FROM WELL EE-11

Sauget Area 1
 Sauget and Cahokia, Illinois

COMPOUND	CAS No.	Result	Units
<i>Volatile Organic Compounds (VOCs) By EPA Method 8260</i>			
Acetone	67-64-1	<250	mg/kg
Benzene	71-43-2	44	"
Bromodichloromethane	75-27-4	<25	"
Bromoform	75-25-2	<25	"
Bromomethane	74-83-9	<25	"
Carbon disulfide	75-15-0	<25	"
Carbon tetrachloride	56-23-5	<25	"
Chlorobenzene	108-90-7	710	"
Chloroethane	75-00-3	<25	"
Chloroform	67-66-3	<25	"
Chloromethane	74-87-3	<25	"
Dibromochloromethane	124-48-1	<25	"
Dichloroethane, 1,1-	75-34-3	<25	"
Dichloroethane, 1,2-	107-06-2	<25	"
Dichloroethene, 1,1-	75-35-4	<25	"
Dichloroethene, cis-1,2-	156-59-2	7.9J	"
Dichloroethene, trans-1,2-	156-60-5	<25	"
Dichloropropane, 1,2-	78-87-5	<25	"
Dichloropropene, cis-1,3-	10061-01-5	<25	"
Dichloropropene, trans-1,3-	10061-02-6	<25	"
Ethylbenzene	100-41-4	27	"
Hexanone, 2-	591-78-6	<120	"
Methyl ethyl ketone (2-Butanone)	78-93-3	<120	"
Methyl-2-pentanone, 4-	108-10-1	<120	"
Methylene chloride	75-09-2	<25	"
Styrene	100-42-5	<25	"
Tetrachloroethane, 1,1,2,2-	79-34-5	<25	"
Tetrachloroethene	127-18-4	13J	"
Toluene	108-88-3	5.8J	"
Trichloroethane, 1,1,1-	71-55-6	<25	"
Trichloroethane, 1,1,2-	79-00-5	<25	"
Trichloroethene	79-01-6	<25	"
Vinyl chloride	75-01-4	<25	"
Xylenes (total)	1330-20-7	21J	"
Total VOCs		828.7	mg/kg

TABLE C-1
CHEMICAL COMPOSITION OF OIL SAMPLE FROM WELL EE-11

Sauget Area 1
 Sauget and Cahokia, Illinois

COMPOUND	CAS No.	Result	Units
Semivolatile Organic Compounds (SVOCs) By EPA Method 8270			
Acenaphthene	83-32-9	<860	mg/kg
Acenaphthylene	208-96-8	<860	"
Anthracene	120-12-7	<860	"
Benzo(a)anthracene	56-55-3	<860	"
Benzo(a)pyrene	50-32-8	120J	"
Benzo(b)fluoranthene	205-99-2	<860	"
Benzo(ghi)perylene	191-24-2	180J	"
Benzo(k)fluoranthene	207-08-9	<860	"
Bis(2-chloroethoxy) methane	111-91-1	<860	"
Bis(2-chlorethyl)ether	111-44-4	<860	"
Bis(2-ethylhexyl) phthalate	117-81-7	<860	"
Bromophenyl phenyl ether, 4-	101-55-3	<860	"
Butylbenzyl phthalate	85-68-7	<860	"
Carbazole	86-74-8	<860	"
Chloro-3-methylphenol, 4-	59-50-7	<860	"
Chloroaniline, 4-	106-47-8	410J	"
Chloronaphthalene, 2-	91-58-7	<860	"
Chlorophenol, 2-	95-57-8	<860	"
Chlorophenyl phenyl ether, 4-	7005-72-3	<860	"
Chrysene	218-01-9	440J	"
Dibenz(a,h)anthracene	53-70-3	97J	"
Dibenzofuran	132-64-9	<860	"
Dichlorobenzene, 1,2-	95-50-1	130J	"
Dichlorobenzene, 1,3-	541-73-1	<860	"
Dichlorobenzene, 1,4-	106-46-7	150J	"
Dichlorobenzidine, 3,3'-	91-94-1	<1700	"
Dichlorophenol, 2,4-	120-83-2	<860	"
Diethylphthalate	84-66-2	<860	"
Dimethylphenol, 2,4-	105-67-9	<860	"
Dimethyl phthalate	131-11-3	<860	"
Di-n-butyl phthalate	84-74-2	<860	"
Dinitro-o-Cresol, 4,6-	534-52-1	<4400	"
Dinitrophenol, 2,4-	51-28-5	<4400	"
Dinitrotoluene, 2,4-	121-14-2	<860	"
Dinitrotoluene, 2,6-	606-20-2	<860	"
Di-n-octyl phthalate	117-84-0	850J	"
Dinoseb	88-85-7	<860	"
Fluoranthene	206-44-0	<860	"
Fluorene	86-73-7	<860	"
Hexachlorobenzene	118-74-1	<860	"
Hexachlorobutadiene	87-68-3	<860	"
Hexachlorocyclopentadiene	77-47-4	<860	"
Hexachloroethane	67-72-1	<860	"
Indeno(1,2,3-cd)pyrene	193-39-5	110J	"
Isophorone	78-59-1	<860	"

TABLE C-1
CHEMICAL COMPOSITION OF OIL SAMPLE FROM WELL EE-11

Sauget Area 1
 Sauget and Cahokia, Illinois

COMPOUND	CAS No.	Result	Units
Semivolatile Organic Compounds (SVOCs) By EPA Method 8270 Continued			
Methylnaphthalene, 2-	91-57-6	<860	mg/kg
Cresol, o-	95-48-7	<860	"
Cresol, p-	106-44-5	<860	"
Naphthalene	91-20-3	<860	"
Nitroaniline, 2-	88-74-4	<4400	"
Nitroaniline, 3-	99-09-2	<4400	"
Nitroaniline, 4-	100-01-6	<4400	"
Nitrobenzene	98-95-3	<860	"
Nitrophenol, 2-	88-75-5	<860	"
Nitrophenol, 4-	100-02-7	<4400	"
N-nitrosodi-n-propylamine	621-64-7	<860	"
Nitrosodiphenylamine, N-	86-30-6	<860	"
Pentachlorophenol	87-86-5	<4400	"
Phenanthrene	85-01-8	<860	"
Phenol	108-95-2	<860	"
Pyrene	129-00-0	360J	"
Trichlorobenzene, 1,2,4-	120-82-1	450J	"
Trichlorophenol, 2,4,5-	95-95-4	<860	"
Trichlorophenol, 2,4,6-	88-06-2	<860	"
Total SVOCs		3297	mg/kg
Metals By EPA Method 6010			
Aluminum	7429-90-5	39	mg/kg
Antimony	7440-36-0	<1.90	"
Arsenic	7440-38-2	<.93	"
Barium	7440-39-3	310	"
Beryllium	7440-41-7	<.37	"
Cadmium	7440-43-9	0.20B	"
Calcium	7440-70-2	300	"
Chromium	7440-47-3	270	"
Cobalt	7440-48-4	1.1	"
Copper	7440-50-8	0.60B	"
Iron	7439-89-6	140	"
Lead	7439-92-1	380	"
Magnesium	7439-95-4	8.7B	"
Mercury	7439-97-6	0.026B	"
Nickel	7440-02-0	43	"
Potassium	7440-09-7	29B	"
Selenium	7782-49-2	<.93	"
Silver	7440-22-4	<.93	"
Sodium	7440-23-5	36B	"
Thallium	7440-28-0	<.93	"
Vanadium	7440-62-2	6.6	"
Zinc	7440-66-6	15	"
Total Metals		1579	mg/kg

TABLE C-1
CHEMICAL COMPOSITION OF OIL SAMPLE FROM WELL EE-11

Sauget Area 1
 Sauget and Cahokia, Illinois

COMPOUND	CAS No.	Result	Units
Pesticides By EPA Method 8081			
Aldrin	309-00-2	<0.25	mg/kg
alpha-BHC	319-84-6	<0.25	"
beta-BHC	319-85-7	<0.25	"
Gamma-BHC (Lindane)	58-89-9	<0.25	"
delta-BHC	319-86-8	<0.25	"
alpha Chlordane	5103-71-9	<0.25	"
Gamma Chlordane	5103-74-2	<0.25	"
4,4'-DDD	72-54-8	61P	"
4,4'-DDE	72-55-9	4P	"
4,4'-DDT	50-29-3	88P	"
Dieldrin	60-57-1	<0.50	"
Endosulfan I	959-98-8	<0.25	"
Endosulfan II	33213-65-9	<0.50	"
Endosulfan sulfate	1031-07-8	<0.50	"
Endrin	72-20-8	<0.50	"
Endrin aldehyde	7421-93-4	<0.50	"
Endrin ketone	53494-70-5	<0.50	"
Heptachlor	76-44-8	<0.25	"
Heptachlor epoxide	1024-57-3	<0.25	"
Methoxychlor	72-43-5	<2.5	"
Toxaphene	8001-35-2	<25	"
Total Pesticides		153	mg/kg
Chlorinated Herbicides By EPA Method 8151			
2,4-D	94-75-7	<0.083	mg/kg
Dalapon	75-99-0	<20	"
2,4-DB	94-82-6	<0.083	"
Dicamba	1918-00-9	<2	"
Dichloroprop	120-36-5	<1	"
MCPA	94-74-6	<20	"
MCPP	7085-19-0/ 93-65-2	<20	"
Pentachlorophenol	87-86-5	31	"
2,4,5-T	93-76-5	<0.083	"
2,4,5-TP (Silvex)	93-72-1	<0.083	"
Total Chlorinated Herbicides		31	mg/kg
Polychlorinated Biphenyls (PCBs) By EPA Method 8082			
Aroclor 1016	12674-11-2	<5	mg/kg
Aroclor 1221	11104-28-2	<10	"
Aroclor 1232	11141-16-5	<5	"
Aroclor 1242	53469-21-9	87	"
Aroclor 1248	12672-29-6	<5	"
Aroclor 1254	11097-69-1	870P	"
Aroclor 1260	11096-82-5	1600P	"
Total PCBs		2557	mg/kg

TABLE C-1
CHEMICAL COMPOSITION OF OIL SAMPLE FROM WELL EE-11

Sauget Area 1
 Sauget and Cahokia, Illinois

COMPOUND	CAS No.	Result	Units
Dioxins and Furans By EPA Method 8280A			
2,3,7,8-TCDD	1746-01-6	<2.9	ng/g
Total TCDD		<3.6	"
1,2,3,7,8-PeCDD	40321-76-4	<33	"
Total PeCDD		<33	"
1,2,3,4,7,8-HxCDD	39227-28-6	<10	"
1,2,3,6,7,8-HxCDD	57653-85-7	77J	"
1,2,3,7,8,9-HxCDD	19408-74-3	<27	"
Total HxCDD		300	"
1,2,3,4,6,7,8-HpCDD	35822-39-4	2400	"
Total HpCDD		4500	"
OCDD	3268-87-9	19000E	"
2,3,7,8-TCDF	51207-31-9	<20	"
Total TCDF		<20	"
1,2,3,7,8-PeCDF	57117-41-6	<3.4	"
2,3,4,7,8-PeCDF	57117-31-4	<7.2	"
Total PeCDF		<20	"
1,2,3,4,7,8-HxCDF	70648-26-9	<59	"
1,2,3,6,7,8-HxCDF	57117-44-9	<17	"
2,3,4,6,7,8-HxCDF	60851-34-5	<18	"
1,2,3,7,8,9-HxCDF	72918-21-9	<10	"
Total HxCDF		400	"
1,2,3,4,6,7,8-HpCDF	67562-39-4	750	"
1,2,3,4,7,8,9-HpCDF	55673-89-7	78J	"
Total HpCDF		3500	"
OCDF	39001-02-0	3900	"
Total Dioxins and Furans		31600	ng/g

Notes:

- The oil sample was collected from EE-11 on May 19, 2004.
- All analyses were conducted by Severn Trent Laboratories (STL), Savannah, Georgia, with the exception of dioxins and furans which were analyzed by STL, Sacramento, California. Detected analytes are presented in bold type.
- J = Analyte detected below the reporting limit but above the method detection limit (MDL).
 < = Analyte not detected at the specified reporting limit. B = Reported value was obtained from a reading that was less than the project reporting limit but greater than or equal to the method detection limit.
 S = The reported value was determined by the method of standard additions (MSA).
 E = Estimated result. Result exceeds the calibration range.
 P = Identification of target analytes using GC methodology is based on retention time. Although two dissimilar GC columns confirmed the presence of target analyte in sample, relative percent difference is >40%. Thus, viewer discretion should be employed during data review and interpretation of results for this target compound.

June 24, 2004

James A. Kearley
Groundwater Services, Inc.
2211 Norfolk, Suite 1000
Houston, Texas 77098

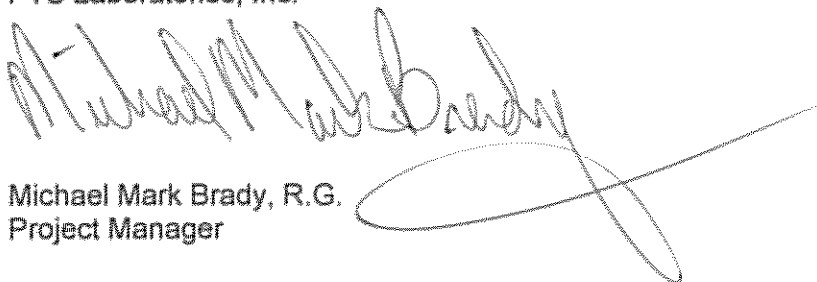
Re: Fluid Properties Data
PTS File No: 34379
Monsanto / Sauget Area 1

Dear Mr. Kearley:

Please find enclosed Fluid Properties Data from analyses conducted upon fluids received from your Monsanto / Sauget Area 1 project. An electronic version of the data has previously been sent to your attention via the Internet. All analyses were performed by applicable ASTM, EPA or API methodologies. The remaining fluids are currently in storage and will be disposed at sixty days from project completion.

PTS Laboratories, Inc. appreciates the opportunity to be of service. If you have any questions or require additional information, please give me a call at (562) 907-3607.

Sincerely,
PTS Laboratories, Inc.



Michael Mark Brady, R.G.
Project Manager

Encl.

VISCOSITY, SPECIFIC GRAVITY and DENSITY DATA

(METHODOLOGY: ASTM D1481, ASTM D445, API RP40)

PROJECT NAME: Monsanto / Sauget Area 1
PROJECT NO: G-2876-104

SAMPLE ID	MATRIX	TEMP., (°F)	SPECIFIC GRAVITY	DENSITY (g/cc)	VISCOSITY	
					(centistokes)	(centipoise)
EE-11 NAPL	Water	70	1.0053	1.0033	1.005	1.009
		100	1.0041	0.9971	0.702	0.700
		130	1.0086	0.9944	0.528	0.525
EE-11 NAPL	NAPL	70	0.8917	0.8899	26.4	23.5
		100	0.8858	0.8796	12.5	11.0
		130	0.8831	0.8707	7.19	6.26

INTERFACIAL / SURFACE TENSION DATA

(METHODOLOGY: DuNuoy Method - ASTM D971)

PROJECT NAME: Monsanto / Sauget Area 1
PROJECT NO: G-2876-104

PHASE PAIR		TEMP., ("F)	INTERFACIAL TENSION, (Dynes/centimeter)
SAMPLE ID / PHASE	SAMPLE ID / PHASE		
EE-11 NAPL (Water)	Air	79	58.3
EE-11 NAPL (NAPL)	Air	79	29.8
EE-11 NAPL (Water)	EE-11 NAPL (NAPL)	79	15.4

QUALITY CONTROL DATAPHASE PAIR: DI WATER / AIR
TEMPERATURE, "F: 79
IFT, MEASURED: 72.6
IFT, PUBLISHED: 71.8
RPD: 1.14



HOUSTON LABORATORY
8880 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 860-0901

Certificate of Analysis

Number: 1030-2004050236-001A

James Kearley
Groundwater Services, Inc.
2211 Norfolk Ste 1000
Houston TX 77098

May 20, 2004

Sample ID: EE- 11 NAPL
Project Name : Monsanto / Sauget Area 1
Project Number : G- 2876
Project Location:
Sample Point:

Sampled By:
Sample Of: Liquid
Sample Date: 05/19/2004 10:15
Sample Conditions:
PO / Ref. No:

ANALYTICAL DATA

ASTM D86 Distillation

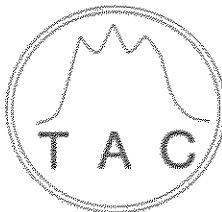
% Recovery	° F @ 769 mm Hg	Lab Tech.	Date Analyzed
Initial Boiling Point	517	MES	05/20/04
5	530		
10	535		
20	542		
30	548		
40	556		
50	565		
60	576		
70	598		
80	640		
90	690		
95	NR		
Final Boiling Point	700		
Volume % Recovery	95		
Volume% Residue	5		
Volume % Loss	0		

Comments: Visual color is dark straw. Loss and residue observed. Temperatures uncorrected for barometric pressure. Sample experienced decomposition @ 700°F.


Hydrocarbon Laboratory Manager

16840 Barker Springs #302
Houston, Texas 77084

(281) 578-2289
Fax: (281) 578-2295
villalanti@earthlink.net



Triton Analytics Corp.

Reference Laboratories

- Hydrocarbon
- Chemical
- Environmental

Dan Villalanti, *Pres.* • Joe Raia, *Lab Director* • Calvin Blakley, *Mass Spec* • Jeanne Malloy, *GC*

September 15, 2004

Laboratory Reference: TAC 3895(A)

James Kearley
Groundwater Services, Inc.
2211 Norfolk, Suite 1000
Houston, TX 77098

Dear Mr. Kearley:

The High-temperature Simulated Distillation (HTSD) results for your sample identified below are enclosed and were reported to you earlier by Email 8/10/04.

EE-11 Oil from Monitoring Well

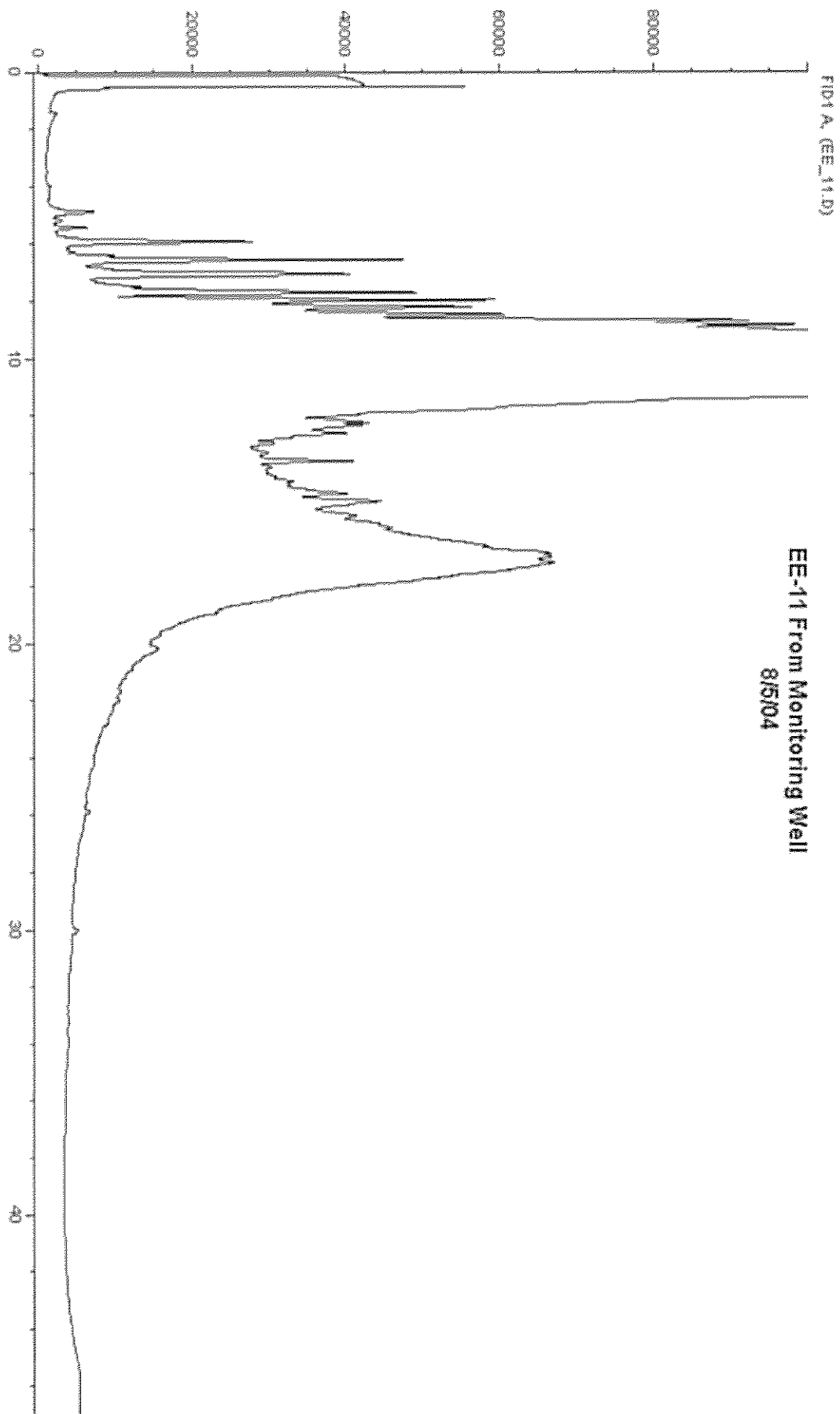
The boiling characteristics of this sample did not show any significant contribution of hydrocarbon materials in the range of gasoline, kerosene or jet fuel, however there was a significant portion of material in the diesel range as shown in the overlay HTSD chromatogram of the sample with a diesel fuel sample. There is also a second boiling region of material present in the C23 carbon number range which is more characteristic of a vacuum gas oil or heavier oil.

When we received the sample it appeared homogenous, but also appeared to contain some water. Prior to sampling we centrifuged the sample for 10 minutes to isolate the hydrocarbon layer. The proportion of water to hydrocarbon present is shown in the enclosed photograph of the vial of the centrifuged sample. Please note in the photo some sediment at the bottom of the vial which we tested but did not appear to be magnetic. Also included in this data package for reference are an illustration of the distillation characteristics of fuels and a table of properties of typical crude oil fractions.

Thank you and please let us know if you have any questions.

Regards,

Dan C. Villalanti
DCV/jcr
Enclosures



TAC-2

===== AC Software version M2.5 =====
 Simdis HT 750 Analyzer
 =====

Data File Name: C:\HPCHEM\1\DATA\0809A\009F1201.D
 Instrument : 1 Vial : 9
 Operator : Triton Analyt. Injection : 1
 Acquired on : 09 Aug 04 09:53 PM Seq. line : 12
 Processed on : 10 Aug 04 9:26 AM
 Sample name : EE-11 RE MW Sample Amt: 0.1024
 Methodname : MHC30.MTH ISTD amt : 0.0000
 Calc. Based On: ESTD Weight CS2: 4.8756
 Sequencename : 0809A Cryogenic sequence

Blank used : C:\HPCHEM\1\DATA\0809A\008F1101.D
 BP Calib. used: C:\HPCHEM\1\DATA\0809A\090F0101.D
 Reference used: C:\HPCHEM\1\DATA\0809A\095F0301.D

Recovery(%) : 102.4 found, 99.5% recovery assumed
 Resp. Factor : 1.520E-10 Threshold set : 100.0
 IBP : 430 F Start Elution : 0.00
 FBP : > 1351 F End Elut after: 43.30

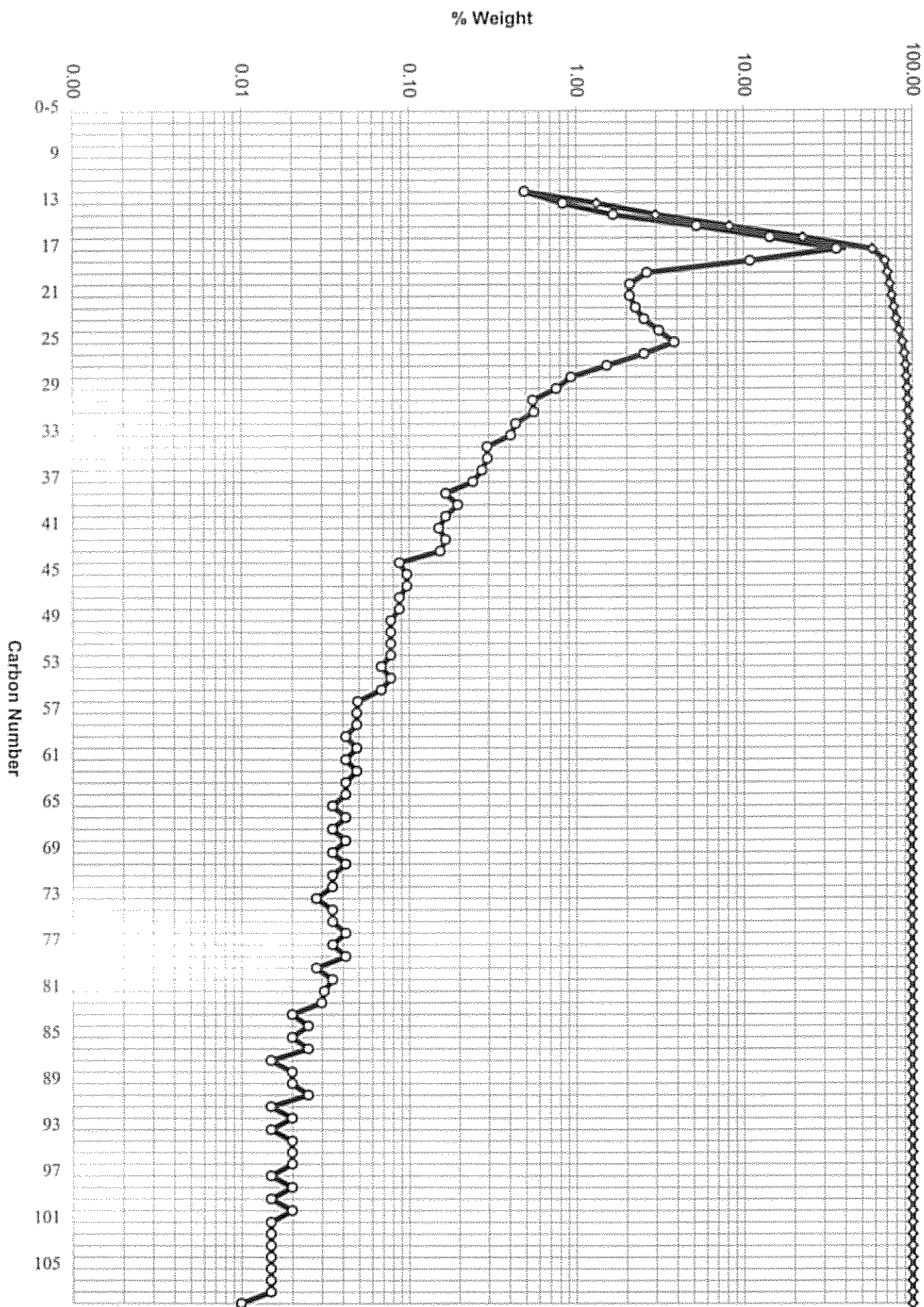
 Analysis results : %Weight versus Boiling point

%	BP(F)	%	BP(F)	%	BP(F)	%	BP(F)
1	448	26	552	51	570	76	678
2	469	27	554	52	572	77	689
3	489	28	554	53	572	78	696
4	498	29	556	54	574	79	705
5	505	30	556	55	574	80	714
6	511	31	558	56	574	81	721
7	516	32	558	57	576	82	729
8	520	33	559	58	576	83	734
9	523	34	559	59	577	84	739
10	525	35	561	60	577	85	745
11	527	36	561	61	579	86	748
12	531	37	561	62	579	87	754
13	532	38	563	63	581	88	761
14	536	39	563	64	581	89	766
15	538	40	563	65	583	90	775
16	540	41	565	66	586	91	788
17	541	42	565	67	590	92	802
18	543	43	565	68	595	93	826
19	543	44	567	69	603	94	853
20	545	45	567	70	612	95	887
21	547	46	567	71	622	96	936
22	549	47	568	72	633	97	1002
23	550	48	568	73	646	98	1105
24	550	49	568	74	657	99	1251
25	552	50	570	75	669		

 Analysis results : Table of cutpoints

BP(F)	%	BP(F)	%	BP(F)	%	BP(F)	%
480	2.3	750	86.1	900	95.3	1100	98.0
650	73.4	800	91.8	1000	97.0	1200	98.7

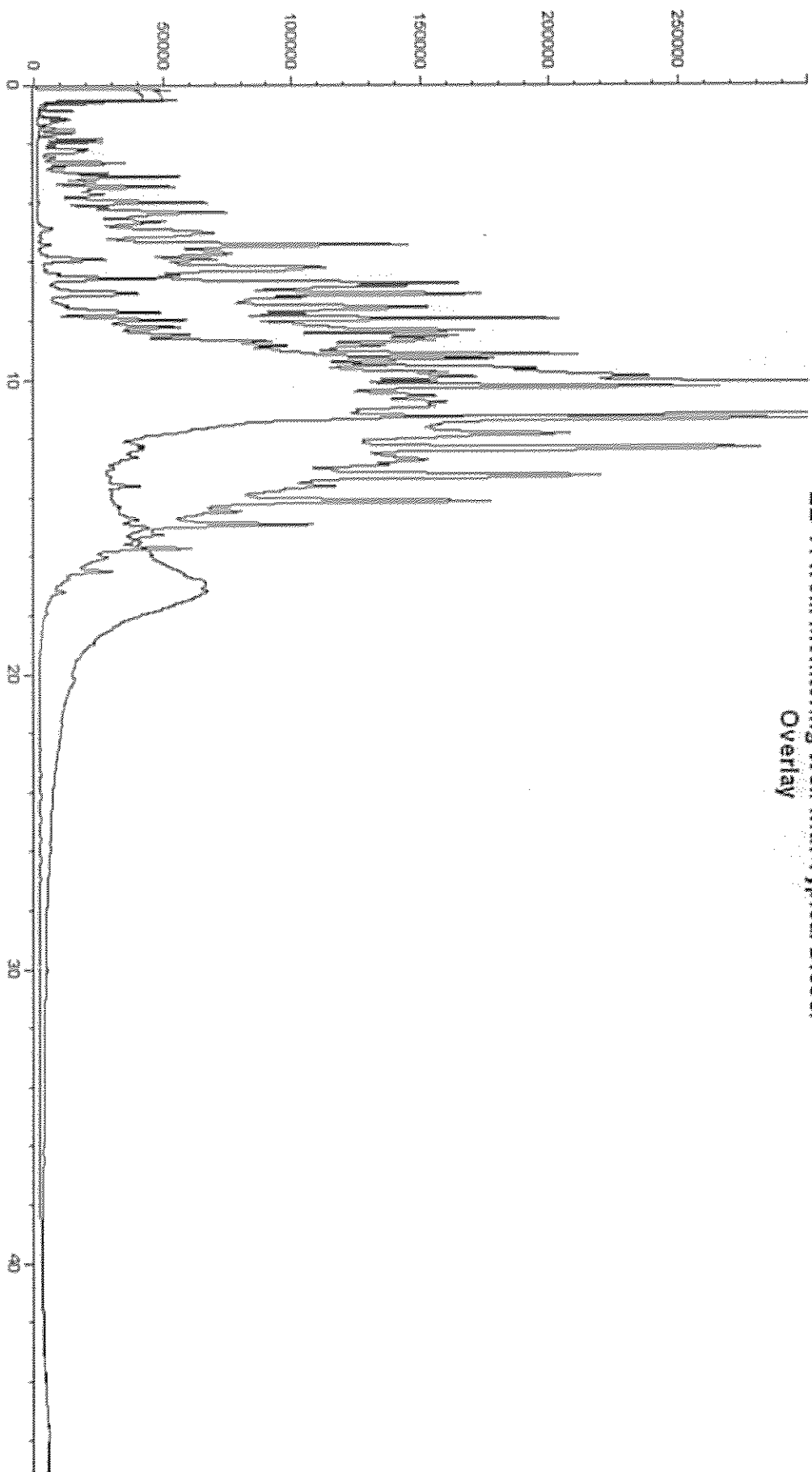
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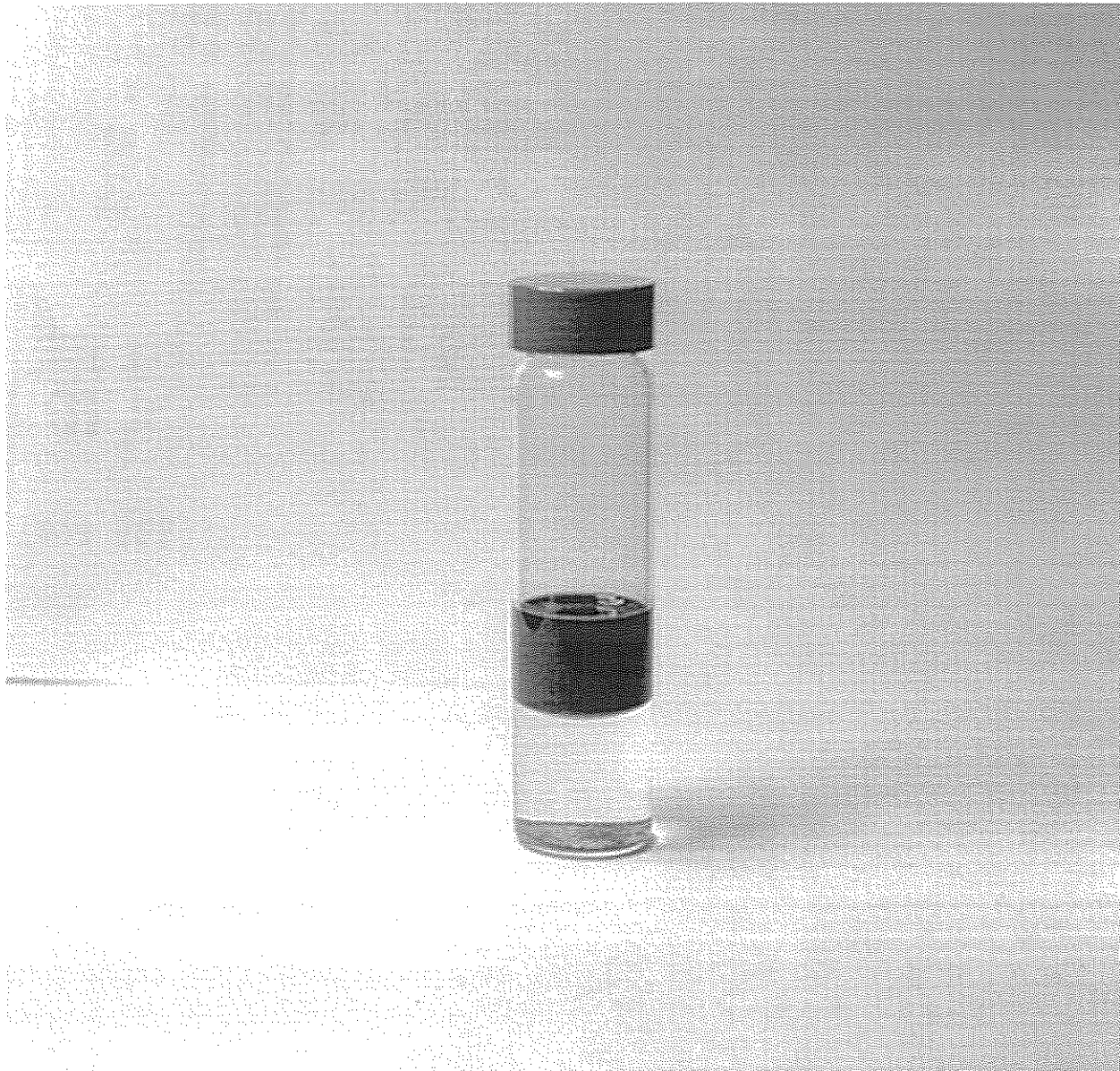
44	296.7	566.1	97	98	1001.8	1105.2	49	97.55	0.08	1059
45	297.1	566.8	97	98	1001.8	1105.2	50	97.63	0.08	1067
46	297.4	567.3	97	98	1001.8	1105.2	51	97.71	0.08	1075
47	297.8	568	97	98	1001.8	1105.2	52	97.79	0.08	1083
48	298.1	568.6	97	98	1001.8	1105.2	53	97.85	0.07	1090
49	298.5	569.3	97	98	1001.8	1105.2	54	97.93	0.08	1098
50	298.9	570	97	98	1001.8	1105.2	55	98.00	0.07	1105
51	299.3	570.7	98	99	1105.2	1250.1	56	98.05	0.05	1112
52	299.7	571.5	98	99	1105.2	1250.1	57	98.10	0.05	1119
53	300.1	572.2	98	99	1105.2	1250.1	58	98.14	0.05	1126
54	300.5	572.9	98	99	1105.2	1250.1	59	98.18	0.04	1132
55	301	573.8	98	99	1105.2	1250.1	60	98.23	0.05	1139
56	301.5	574.7	98	99	1105.2	1250.1	61	98.27	0.04	1145
57	301.9	575.4	98	99	1105.2	1250.1	62	98.32	0.05	1152
58	302.3	576.1	98	99	1105.2	1250.1	63	98.36	0.04	1158
59	302.7	576.9	98	99	1105.2	1250.1	64	98.41	0.04	1164
60	303.1	577.6	98	99	1105.2	1250.1	65	98.44	0.03	1169
61	303.5	578.3	98	99	1105.2	1250.1	66	98.48	0.04	1175
62	304	579.2	98	99	1105.2	1250.1	67	98.52	0.03	1180
63	304.6	580.3	98	99	1105.2	1250.1	68	98.56	0.04	1186
64	305.3	581.5	98	99	1105.2	1250.1	69	98.59	0.03	1191
65	306.4	583.5	98	99	1105.2	1250.1	70	98.63	0.04	1197
66	308	586.4	98	99	1105.2	1250.1	71	98.67	0.03	1202
67	310.3	590.5	98	99	1105.2	1250.1	72	98.70	0.03	1207
68	313.1	595.6	98	99	1105.2	1250.1	73	98.73	0.03	1211
69	317.2	603	98	99	1105.2	1250.1	74	98.76	0.03	1216
70	322.4	612.3	98	99	1105.2	1250.1	75	98.80	0.03	1221
71	327.7	621.9	98	99	1105.2	1250.1	76	98.84	0.04	1227
72	334	633.2	98	99	1105.2	1250.1	77	98.88	0.03	1232
73	341.1	646	98	99	1105.2	1250.1	78	98.92	0.04	1238
74	347.3	657.1	98	99	1105.2	1250.1	79	98.94	0.03	1242
75	353.6	668.5	98	99	1105.2	1250.1	80	98.98	0.03	1247
76	359.4	678.9	99	99.5	1250.1	1351.2	81	99.01	0.03	1252
77	364.5	688.1	99	99.5	1250.1	1351.2	82	99.04	0.03	1258
78	369.4	696.9	99	99.5	1250.1	1351.2	83	99.06	0.02	1262
79	374.3	705.7	99	99.5	1250.1	1351.2	84	99.08	0.02	1267
80	378.7	713.7	99	99.5	1250.1	1351.2	85	99.10	0.02	1271
81	382.8	721	99	99.5	1250.1	1351.2	86	99.13	0.02	1276
82	386.5	727.7	99	99.5	1250.1	1351.2	87	99.14	0.01	1279
83	389.9	733.8	99	99.5	1250.1	1351.2	88	99.16	0.02	1283
84	392.8	739	99	99.5	1250.1	1351.2	89	99.18	0.02	1287
85	395.7	744.3	99	99.5	1250.1	1351.2	90	99.21	0.02	1292
86	398.5	749.3	99	99.5	1250.1	1351.2	91	99.22	0.01	1295
87	401.4	754.5	99	99.5	1250.1	1351.2	92	99.24	0.02	1299
88	404.7	760.5	99	99.5	1250.1	1351.2	93	99.26	0.01	1302
89	408.4	767.1	99	99.5	1250.1	1351.2	94	99.28	0.02	1306
90	413.3	775.9	99	99.5	1250.1	1351.2	95	99.30	0.02	1310
91	419.6	787.3	99	99.5	1250.1	1351.2	96	99.32	0.02	1314
92	428.2	802.8	99	99.5	1250.1	1351.2	97	99.33	0.01	1317
93	440.7	825.3	99	99.5	1250.1	1351.2	98	99.35	0.02	1321
94	456	852.8	99	99.5	1250.1	1351.2	99	99.37	0.01	1324
95	475.2	887.4	99	99.5	1250.1	1351.2	100	99.39	0.02	1328
96	501.7	935.1	99	99.5	1250.1	1351.2	101	99.40	0.01	1331
97	538.8	1001.8	99	99.5	1250.1	1351.2	102	99.41	0.01	1334
98	596.2	1105.2	99	99.5	1250.1	1351.2	103	99.43	0.01	1337
99	676.7	1250.1	99	99.5	1250.1	1351.2	104	99.44	0.01	1340
99.5	732.9	1351.2	99	99.5	1250.1	1351.2	105	99.46	0.01	1343
			99	99.5	1250.1	1351.2	106	99.47	0.01	1346
			99	99.5	1250.1	1351.2	107	99.49	0.01	1349
			99	99.5	1250.1	1351.2	108	99.50	0.01	1351

FID1 A. (EE_11.D)
FID1 A. (TACDIE.D)

EE-11 from Monitoring Well with Typical Diesel
Overlay



F-20 L

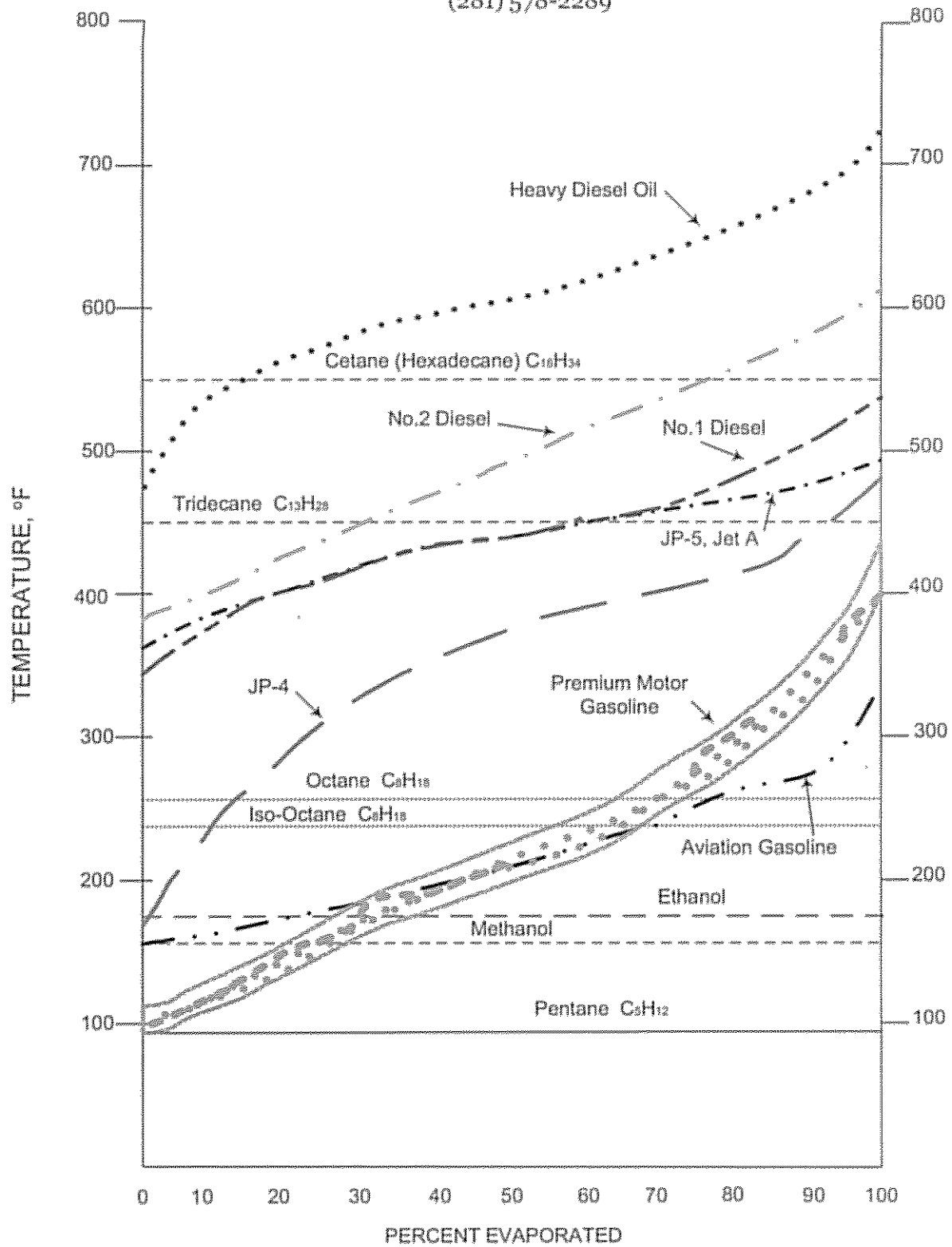


Crude Oil Fractions

Stream Name	Boiling Range	Carbon Number	Disposition
·Off Gas	---	1-3	To Sats Gas Plant
·SR Butane	---	4	To Butane Splitter
·SR Gasoline	70-130	5-6	To Mogas or Isom
·SR Lt Naphtha	120-220	6-7	To Reformer/Arom. Extract
·SR Hvy Naphtha	200-400	7-11	To Reformer/Mogas
·Kerosene	350-500	11-14	Jet Fuel via DHT
·SR Lt Gas Oil	450-650	14-20	Diesel/Furnace Oil via DHT
·SR Hvy Gas Oil	600-800	20-25	To Conversion Units
·SR Resid ·Atmos Resid ·Long Resid	800 +	25 +	To Vacuum Flashers/Towers
·Flashed Dist ·Vacuum Gas Oils	800-1050	25-35	Cat Feed To Conversion Units
·Pitch ·Vacuum Resid ·Short Resid	1000 +	35 +	To Asphalt, Residual Fuel, Cokers, Resid Conversion

Note: SR means Straight Run, i.e., from Crude Unit

Triton Analytics Corp.
(281) 578-2289



Distillation Characteristics of Fuels

**APPENDIX C.2
PHYSICAL PROPERTIES AND CHEMICAL COMPOSITION OF
OIL SAMPLE FROM WELL BR-1**

C.2 Physical Properties and Chemical Composition of Oil Sample from Well BR-1
(2 pages)

Table C-2: Chemical Composition of Oil Sample from Well BR-1 (5 pages)

Physical properties testing results from PTS Laboratories (4 pages)

ASTM D86 Distillation Test results from SPL, Inc. (3 pages)

High Temperature Simulated Distillation (HTSD) results from Triton Analytics Corp.
(7 pages)

C.2 PHYSICAL PROPERTIES AND CHEMICAL COMPOSITION OF OIL SAMPLE FROM WELL BR-I

On October 27, 2004, personnel from Groundwater Services, Inc. (GSI) collected a sample of oil from well BR-I, which is located at Site I. The oil was reported to have dark brown color and the consistency of motor oil. Results of field measurements indicated a specific gravity of 1.42 and viscosity of 5.5 centistokes at a temperature of 63 °F. The specific gravity measurement and visual observations confirmed that the oil is a DNAPL.

Two 40-mL vials of the oil sample from BR-I were submitted to Severn Trent Laboratories in Savannah, Georgia, for laboratory analysis of VOCs, SVOCs, pesticides, herbicides, PCBs, dioxins/furans, and metals. Analytical results are presented on Table C-2 and summarized below. Approximately 17% of the sample composition by weight was identified by these analytical methods. Copies of laboratory reports are attached.

Chemical Constituents in Oil Sample from BR-I	Reported Concentration (mg/kg)	Weight Fraction (%)
VOCs (total)	702	0.070
1,2-Dichlorobenzene	1900	0.19
1,4-Dichlorobenzene	8400	0.84
1,2,4-Trichlorobenzene	140,000	14
Hexachlorobenzene	10,000	1.0
Other SVOCs	758	0.076
Pesticides (total)	1404	0.14
Herbicides (total)	87	0.0087
PCBs (total)	1500	0.15
Dioxins/Furans (total)	25.4*	0.0025
Metals (total)	1879	0.19
Total Weight Fraction for Identified Constituents:		16.7%
* = 2,3,7,8-TCDD and 1,2,3,7,8-PeCDD were detected in the oil sample at estimated concentrations of 12 ng/g and 8.5 ng/g, respectively.		

A liter bottle containing groundwater and oil was submitted for laboratory analysis of fluid properties at PTS Laboratories in Santa Fe Springs, California. The sample was tested using ASTM D445 and ASTM D1481, which include measurement of: i) dynamic viscosity and fluid density at three temperatures; ii) surface tension for each fluid; and iii) interfacial tension for oil/water, oil/air, and water/air. Results of laboratory testing of the DNAPL sample indicated a specific gravity of 1.44 and viscosity of 5.92 centistokes at a temperature of 70 °F.

An additional volume of sample was submitted to SPL, Inc. of Houston, Texas, for analysis by ASTM Method D86 Distillation. Initial boiling point of the oil was 432 °F, and final boiling point was 530 °F.

A vial of oil from BR-I was submitted to Triton Analytics Corporation of Houston, Texas, for High Temperature Simulated Distillation (HTSD). The HTSD test is a GC technique that separates individual hydrocarbon components in the order of their boiling points, giving a percent mass yield as a function of boiling point. The HTSD test can be used to determine the carbon number distribution up to C120.

Prior to conducting the HTSD test, Triton Analytics centrifuged the contents of the vial to isolate the oil layer. Triton Analytics reported that the sample is likely a synthetic product. Based on the low percent recovery from the test, the sample has a significant component which is either not a hydrocarbon or is insoluble in carbon disulfide. Test results indicated that compounds with carbon numbers of 13 or less comprised approximately 80% of the sample by weight.

Key Findings: The oil sample collected from well BR-I was determined to be a DNAPL. Chemical constituents identified by various analytical methods comprised approximately 17 percent of the sample by weight. The predominant identified constituent was 1,2,4-trichlorobenzene, which comprised 14% of the sample by weight.

TABLE C-2
 CHEMICAL COMPOSITION OF OIL SAMPLE FROM WELL BR-1

Sauget Area 1
 Sauget and Cahokia, Illinois

COMPOUND	CAS No.	Result	Units
Volatile Organic Compounds (VOCs) by EPA Method 8260			
1,1,1-Trichloroethane	71-55-6	<10	mg/kg
1,1,2,2-Tetrachloroethane	79-34-5	<10	"
1,1,2-Trichloroethane	79-00-5	<10	"
1,1-Dichloroethane	75-34-3	<10	"
1,1-Dichloroethene	75-35-4	<10	"
1,2-Dichloroethane	107-06-2	<10	"
1,2-Dichloropropane	78-87-5	<10	"
2-Butanone (MEK)	78-93-3	<50	"
2-Hexanone	591-78-6	<50	"
4-Methyl-2-pentanone (MIBK)	108-10-1	<50	"
Acetone	67-64-1	<100	"
Benzene	71-43-2	19	"
Bromodichloromethane	75-27-4	<10	"
Bromoform	75-25-2	<10	"
Bromomethane	74-83-9	<10	"
Carbon Disulfide	75-15-0	<10	"
Carbon Tetrachloride	56-23-5	<10	"
Chlorobenzene	108-90-7	220	"
Chloroethane (ethyl chloride)	75-00-3	<10	"
Chloroform	67-66-3	<10	"
Chloromethane	74-87-3	<10	"
cis-1,2-Dichloroethene	156-59-2	<10	"
cis-1,3-Dichloropropene	10061-01-5	<10	"
Dibromochloromethane	124-48-1	<10	"
Ethyl benzene	100-41-4	350	"
Styrene	100-42-5	<10	"
Tetrachloroethene	127-18-4	38	"
Toluene	108-88-3	27	"
trans-1,2-Dichloroethene	156-60-5	<10	"
trans-1,3-Dichloropropene	10061-02-6	<10	"
Trichloroethene	79-01-6	5J	"
Vinyl Chloride	75-01-4	<10	"
Xylenes, Total	1330-20-7	43	"
Total VOCs		702	mg/kg

TABLE C-2
 CHEMICAL COMPOSITION OF OIL SAMPLE FROM WELL BR-1

Sauget Area 1
 Sauget and Cahokia, Illinois

COMPOUND	CAS No.	Result	Units
<i>Semivolatile Organic Compounds by EPA Method 8270</i>			
1,2,4-Trichlorobenzene	120-82-1	140000	mg/kg
1,2-Dichlorobenzene	95-50-1	1900J	"
1,3-Dichlorobenzene	541-73-1	<71	"
1,4-Dichlorobenzene	106-46-7	8400	"
2,4,5-Trichlorophenol	95-95-4	<71	"
2,4,6-Trichlorophenol	88-06-2	<71	"
2,4-Dichlorophenol	120-83-2	<71	"
2,4-Dimethylphenol	105-67-9	<71	"
2,4-Dinitrophenol	51-28-5	<370	"
2,4-Dinitrotoluene	121-14-2	<71	"
2,6-Dinitrotoluene	606-20-2	<71	"
2-Chloronaphthalene	91-58-7	<71	"
2-Chlorophenol	95-57-8	<71	"
2-Methylnaphthalene	91-57-6	84	"
2-Methylphenol (o-Cresol)	95-48-7	<71	"
2-Nitroaniline	88-74-4	<370	"
2-Nitrophenol	88-75-5	<71	"
3,3'-Dichlorobenzidine	91-94-1	<140	"
3-Methylphenol/4-Methylphenol (m&p-Cresol)	106-44-5	<71	"
3-Nitroaniline	99-09-2	<370	"
4,6-Dinitro-2-methylphenol	534-52-1	<370	"
4-Bromophenylphenyl ether	101-55-3	<71	"
4-Chloro-3-methylphenol	59-50-7	<71	"
4-Chloroaniline	106-47-8	<140	"
4-Chlorophenylphenyl ether	7005-72-3	<71	"
4-Nitroaniline	100-01-6	<370	"
4-Nitrophenol	100-02-7	<370	"
Acenaphthene	83-32-9	<71	"
Acenaphthylene	208-96-8	<71	"
Anthracene	120-12-7	<71	"
Benzo(a)anthracene	56-55-3	<71	"
Benzo(a)pyrene	50-32-8	<71	"
Benzo(b)fluoranthene	205-99-2	<71	"
Benzo(g,h,i)perylene	191-24-2	<71	"
Benzo(k)fluoranthene	207-08-9	<71	"
bis(2-Chloroethoxy)methane	111-91-1	<71	"
bis(2-Chloroethyl)ether	111-44-4	<71	"
bis(2-Ethylhexyl)phthalate	117-81-7	<71	"
Butylbenzylphthalate	85-68-7	<71	"
Carbazole	86-74-8	<71	"
Chrysene	218-01-9	<71	"
Dibenzo(a,h)anthracene	53-70-3	<71	"
Dibenzofuran	132-64-9	<71	"
Diethylphthalate	84-66-2	<71	"
Dimethylphthalate	131-11-3	<71	"

TABLE C-2
CHEMICAL COMPOSITION OF OIL SAMPLE FROM WELL BR-1

Sauget Area 1
 Sauget and Cahokia, Illinois

COMPOUND	CAS No.	Result	Units
Semivolatile Organic Compounds by EPA Method 8270			
Di-n-butylphthalate	84-74-2	<71	mg/kg
Di-n-octylphthalate	117-84-0	<71	"
Dinoseb	88-85-7	<71	"
Fluoranthene	206-44-0	<71	"
Fluorene	86-73-7	<71	"
Hexachlorobenzene	118-74-1	10000	"
Hexachlorobutadiene	87-68-3	<71	"
Hexachlorocyclopentadiene	77-47-4	<71	"
Hexachloroethane	67-72-1	<71	"
Indeno(1,2,3-cd)pyrene	193-39-5	<71	"
Isophorone	78-59-1	<71	"
Naphthalene	91-20-3	620	"
Nitrobenzene	98-95-3	<71	"
N-Nitroso-di-n-propylamine	621-64-7	<71	"
N-Nitrosodiphenylamine	86-30-6	<71	"
Pentachlorophenol	87-86-5	<370	"
Phenanthrene	85-01-8	<71	"
Phenol	108-95-2	<71	"
Pyrene	129-00-0	54J	"
Total SVOCs		160000	mg/kg
Metals by EPA Method 6010			
Silver	7440-22-4	<0.93	mg/kg
Aluminum	7429-90-5	24	"
Arsenic	7440-38-2	<0.93	"
Barium	7440-39-3	18	"
Beryllium	7440-41-7	<0.37	"
Calcium	7440-70-2	1600	"
Cadmium	7440-43-9	<0.46	"
Cobalt	7440-48-4	1.5	"
Chromium	7440-47-3	15	"
Copper	7440-50-8	11	"
Iron	7439-89-6	55	"
Potassium	7440-09-7	<93	"
Magnesium	7439-95-4	97	"
Sodium	7440-23-5	<46	"
Nickel	7440-02-0	43	"
Lead	7439-92-1	2.2	"
Antimony	7440-36-0	<1.9	"
Selenium	7782-49-2	<0.93	"
Thallium	7440-28-0	<0.93	"
Vanadium	7440-62-2	5.1	"
Zinc	7440-66-8	7.5E	"
Mercury	7439-97-6	0.011B	"
Total Metals		1900	mg/kg

TABLE C-2
 CHEMICAL COMPOSITION OF OIL SAMPLE FROM WELL BR-1

Sauget Area 1
 Sauget and Cahokia, Illinois

COMPOUND	CAS No.	Result	Units
Pesticides by EPA Method 8081			
4,4'-DDD	72-54-8	<320	mg/kg
4,4'-DDE	72-55-9	<320	"
4,4'-DDT	50-29-3	<320	"
Aldrin	309-00-2	<160	"
alpha-BHC	319-84-6	1300P	"
alpha-Chlordane	5103-71-9	<160	"
beta-BHC	319-85-7	78JP	"
delta-BHC	319-86-8	<160	"
Dieldrin	60-57-1	<320	"
Endosulfan I	959-98-8	<160	"
Endosulfan II	33213-65-9	<320	"
Endosulfan sulfate	1031-07-8	<320	"
Endrin	72-20-8	<320	"
Endrin aldehyde	7421-93-4	<320	"
Endrin ketone	53494-70-5	<320	"
gamma-BHC (Lindane)	58-89-9	26JP	"
gamma-Chlordane	5103-74-2	<160	"
Heptachlor	76-44-8	<160	"
Heptachlor epoxide	1024-57-3	<160	"
Methoxychlor	72-43-5	<1600	"
Toxaphene	8001-35-2	<16000	"
Total SVOCs		1400	mg/kg
Chlorinated Herbicides by EPA Method 8151			
2,4,5-T	93-76-5	23	mg/kg
2,4,5-TP (Silvex)	93-72-1	<3	"
2,4-D	94-75-7	21P	"
2,4-DB	94-82-6	<3	"
Dalapon	75-99-0	<600	"
Dicamba	1918-00-9	<6	"
Dichloroprop	120-36-5	<30	"
MCPA[(4-chloro-2-methylphenoxy)-acetic acid]	94-74-6	<600	"
MCPBP[2-(4-chloro-2-methylphenoxy)-propanoic acid]	93-65-2	<600	"
Pentachlorophenol	87-86-5	43P	"
Total Herbicides		87	mg/kg
Polychlorinated Biphenyls (PCBs) By EPA Method 8082			
Aroclor-1016	12674-11-2	<3200	mg/kg
Aroclor-1221	11104-28-2	<6400	"
Aroclor-1232	11141-16-5	<3200	"
Aroclor-1242	53469-21-9	<3200	"
Aroclor-1248	12672-29-6	<3200	"
Aroclor-1254	11097-69-1	<3200	"
Aroclor-1260	11096-82-5	1500JP	"
Total PCBs		1500	mg/kg

TABLE C-2
 CHEMICAL COMPOSITION OF OIL SAMPLE FROM WELL BR-1

Sauget Area 1
 Sauget and Cahokia, Illinois

COMPOUND	CAS No.	Result	Units
<i>Dioxins and Furans By EPA Method 8280A</i>			
2,3,7,8-TCDD	1746-01-8	12 JA	ng/g
Total TCDD	-	58	"
1,2,3,7,8-PeCDD	40321-76-4	8.5 J	"
Total PeCDD	-	300	"
1,2,3,4,7,8-HxCDD	39227-28-6	6.3 J	"
1,2,3,6,7,8-HxCDD	57653-85-7	49	"
1,2,3,7,8,9-HxCDD	19408-74-3	16	"
Total HxCDD	-	400	"
1,2,3,4,6,7,8-HpCDD	35822-39-4	1100 E	"
Total HpCDD	-	2600	"
OCDD	3268-87-9	12000 E	"
2,3,7,8-TCDF	51207-31-9	58	"
Total TCDF	-	220	"
1,2,3,7,8-PeCDF	57117-41-6	6.9 J	"
2,3,4,7,8-PeCDF	57117-31-4	26	"
Total PeCDF	-	460	"
1,2,3,4,7,8-HxCDF	70648-26-9	380 E	"
1,2,3,6,7,8-HxCDF	57117-44-9	42	"
2,3,4,6,7,8-HxCDF	60851-34-5	10 J	"
1,2,3,7,8,9-HxCDF	72918-21-9	<3.8	"
Total HxCDF	-	1700	"
1,2,3,4,6,7,8-HpCDF	67562-39-4	980 E	"
1,2,3,4,7,8,9-HpCDF	55673-89-7	130	"
Total HpCDF	-	2500	"
OCDF	39001-02-0	5200 E	"
Total Dioxins and Furans		25438	ng/g

Notes:

- The oil sample was collected from BR-1 on Oct 27, 2004.
- All analyses were conducted by Severn Trent Laboratories (STL), Savannah, Georgia. Detected analytes are presented in bold type.
- J = Analyte detected below the reporting limit but above the method detection limit (MDL).
 < = Analyte not detected at the specified reporting limit. B = Reported value was obtained from a reading that was less than the project reporting limit but greater than or equal to the method detection limit.
 E = Estimated result. Result exceeds the calibration range.
 P = Identification of target analytes using GC methodology is based on retention time. Although two dissimilar GC columns confirmed the presence of target analyte in sample, relative percent difference is >40%. Thus, viewer discretion should be employed during data review and interpretation of results for this target compound.
 JA = The analyte was positively identified, but the quantitation is an estimate.

November 24, 2004

James A. Kearley
Groundwater Services, Inc.
2211 Norfolk, Suite 1000
Houston, Texas 77098

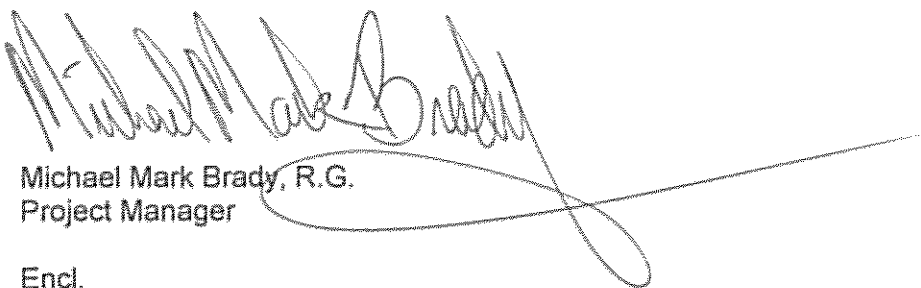
Re: Fluid Properties Data
PTS File No: 34379; GSI Job No. G-2876
DNAPL Characterization Study, Sauget Area 1 Sites, Sauget Illinois

Dear Mr. Kearley:

Please find enclosed Fluid Properties Data from analyses conducted upon fluids received from your Sauget Area 1 project. An electronic version of the data has previously been sent to your attention via the Internet. All analyses were performed by applicable ASTM, EPA or API methodologies. The remaining fluids are currently in storage and will be disposed at sixty days from project completion.

PTS Laboratories, Inc. appreciates the opportunity to be of service. If you have any questions or require additional information, please give me a call at (562) 907-3607.

Sincerely,
PTS Laboratories, Inc.



Michael Mark Brady, R.G.
Project Manager

Encl.

VISCOSITY, SPECIFIC GRAVITY and DENSITY DATA

(METHODOLOGY: ASTM D1401, ASTM D445, API RP40)

PROJECT NAME: DNAPL Characterization Study, Sauget Area 1 Sites, Sauget Illinois
PROJECT NO: GSI Job No. G-2876

SAMPLE ID	MATRIX	TEMP., ("F)	SPECIFIC GRAVITY	DENSITY (g/cc)	VISCOSITY	
					(centistokes)	(centipoise)
BR-I (water)	Water	70	1.0003	0.9983	1.005	1.003
		100	1.0026	0.9956	0.700	0.697
		130	1.0054	0.9913	0.535	0.530
BR-I (NAPL)	NAPL	70	1.4449	1.4420	5.92	8.54
		100	1.4395	1.4295	3.87	5.53
		130	1.4335	1.4134	2.59	3.66

INTERFACIAL / SURFACE TENSION DATA

(METHODOLOGY: DuNuoy Method - ASTM D971)

PROJECT NAME: DNAPL Characterization Study, Sauget Area 1 Sites, Sauget Illinois
PROJECT NO: GSI Job No. G-2876

PHASE PAIR		TEMP., (°F)	INTERFACIAL TENSION, (Dynes/centimeter)
SAMPLE ID / PHASE	SAMPLE ID / PHASE		
BR-I (water)	Air	71	65.7
BR-I (NAPL)	Air	71	33.8
BR-I (water)	BR-I (NAPL)	71	15.0

QUALITY CONTROL DATA

PHASE PAIR:	DI WATER / AIR
TEMPERATURE, °F:	71
IFT, MEASURED:	73.2
IFT, PUBLISHED:	72.5
RPD:	1.01



HOUSTON LABORATORIES
8820 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis

Number: 1030-2004110052-001A

James Kearley
Groundwater Services, Inc.
2211 Norfolk Ste 1000
Houston TX 77098

November 10, 2004

Sample ID:
Station Name: BR-I (NAPL)
Station Number : G-2876
Location: Sauget, IL
Sample Point: Sauget Area 1

Sampled By: R.E
Sample Of: Liquid
Sample Date: 10/27/2004 16:40
Sample Conditions:
PO / Ref. No: G-2876

ANALYTICAL DATA

ASTM D86 Distillation

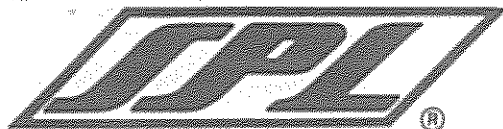
% Recovery	* F @ 771 mm Hg	Lab Tech.	Date Analyzed
Initial Boiling Point	210	MES	11/10/04
5	432		
10	452		
20	458		
30	468		
40	478		
50	484		
60	498		
70	508		
80	514		
90	NR		
95	NR		
Final Boiling Point	530		
Volume % Recovery	88.0		
Volume% Residue	10.0		
Volume % Loss	2.0		

Comments: Visual color is crude. Loss and Residue observed.
Temperatures uncorrected for barometric pressure.
Initial boiling point indicative of water in sample.
Organic IBP would be temperature closer to 5% recovery point.

Sample On: 10/27/2004 16:40


Hydrocarbon Laboratory Manager

Quality Assurance: The above analyses are performed in accordance with ASTM, UOP or GPA guidelines for quality assurance,

**HOUSTON LABORATORIES**8820 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901**Certificate of Analysis**

Number: 1030-2004110052-001A

James Kearley
Groundwater Services, Inc.
2211 Norfolk Ste 1000
Houston TX 77098

November 10, 2004

Sample ID:		Sampled By:	R.E
Station Name:	BR-I (NAPL)	Sample Of:	Liquid
Station Number :		Sample Date:	10/27/2004 16:40
Location:	Sauget, IL	Sample Condition:	
Sample Point:	Sauget Area 1	PO / Ref. No:	G-2876

ANALYTICAL DATA

Test	Method	Result	Unit	Detection Limit	Lab Tech.	Date Analyzed
Water in Crude Oil by Distillation	ASTM-D-4006	2.075	vol%		MES	11/05/04

Comments:

Sample On: 10/27/2004 16:40

Hydrocarbon Laboratory Manager

Quality Assurance: The above analyses are performed in accordance with ASTM, UOP or GPA guidelines for quality assurance, unless otherwise stated.



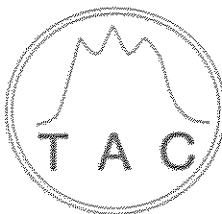
100

[illegible]

459 Hughes Drive, Traverse City, MI 49684 (616) 947-5777

16840 Barker Springs #302
Houston, Texas 77084

(281) 578-2289
Fax: (281) 578-2295
villalanti@earthlink.net



Triton Analytics Corp.

Reference Laboratories

- Hydrocarbon
- Chemical
- Environmental

Dan Villalanti, *Pres.* • Joe Raia, *Lab Director* • Calvin Blakley, *Mass Spec* • Jeanne Malloy, *GC*

November 4, 2004

Laboratory Reference: TAC 3973(A)

James Kearley
Groundwater Services, Inc.
2211 Norfolk, Suite 1000
Houston, TX 77098

Sample ID: BR-I (NAPL)10/27/04
Reference: DNAPL Characterization Study at Sauget Area 1 Sites, Sauget, IL

Dear Mr. Kearley:


The High-temperature Simulated Distillation (HTSD) results for your sample identified below are enclosed and were reported to you earlier by Email 11/03/04.

BR-I (NAPL)10/27/04

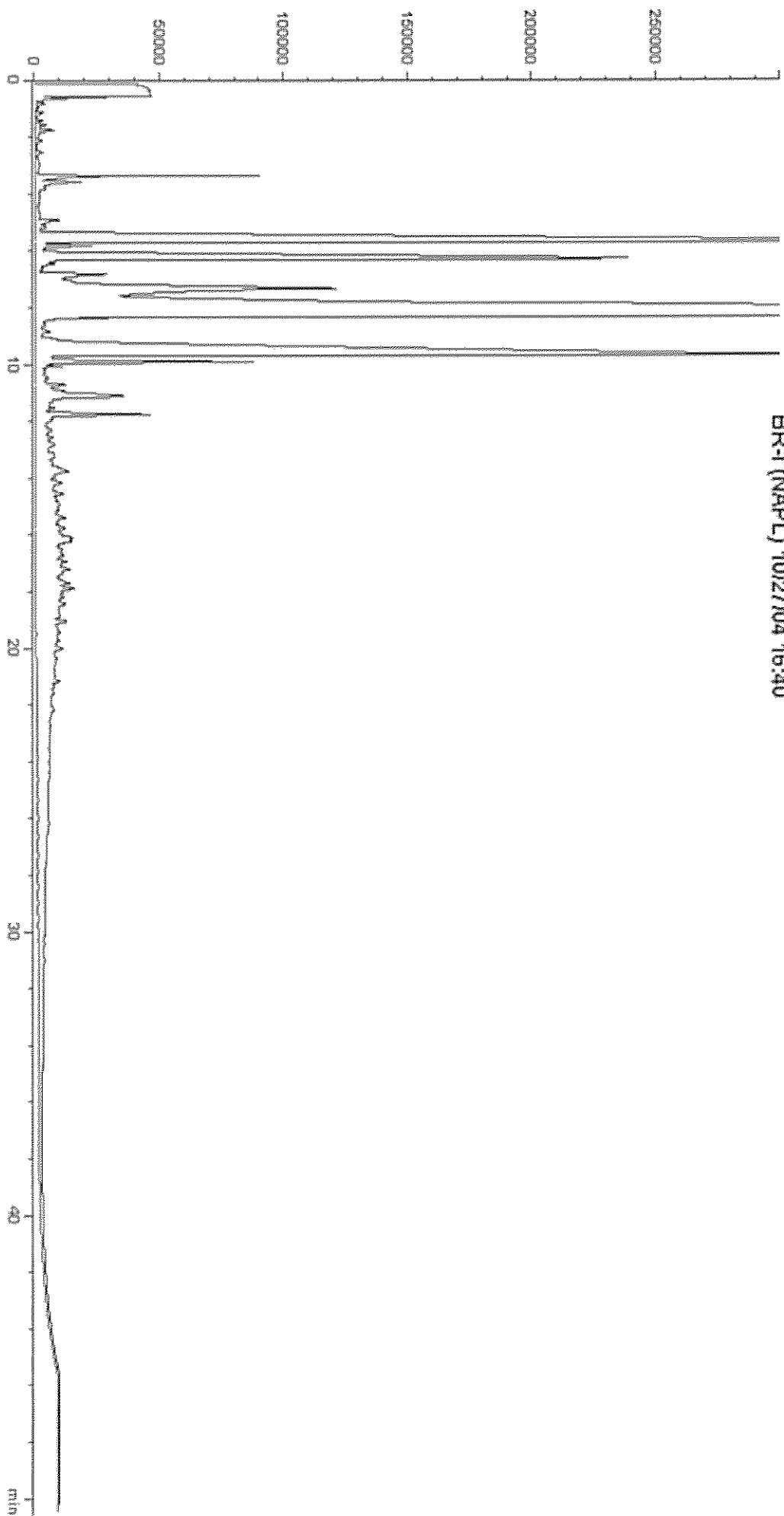
This sample is likely a synthetic product and based upon the low recovery, appears to have a significant component which is either not hydrocarbon or is insoluble in CS₂. Upon centrifugation, there was no appreciable phase separation. We took the liberty of adding two drops of a proprietary demulsifier provided by Baker Petrolite to see if we could improve separation. As demonstrated by the photo, the sample with demulsifier has more sediment and less rag layer.

Thank you and please let us know if you have any questions.

Regards,


Dan C. Villalanti
DCV/kst
Enclosures

BR-1 (NAPL) 10/27/04 16:40



===== AC Software version M2.5 =====
 Simdis HT 750 Analyzer
 =====

Data File Name: C:\HPCHEM\1\DATA\1102A\005F0801.D
 Instrument : 1 Vial : 5
 Operator : Triton Analyt. Injection : 1
 Acquired on : 03 Nov 04 01:39 AM Seq. line : 8
 Processed on : 03 Nov 04 3:30 PM
 Sample name : BR-INAPL1027 Sample Amt: 0.1090
 Methodname : MHC30.MTH ISTD amt : 0.0000
 Calc. Based On: ESTD Weight CS2: 4.8569
 Sequencename : 1102A Cryogenic sequence

Blank used : C:\HPCHEM\1\DATA\1102A\007F1001.D
 BP Calib. used: C:\HPCHEM\1\DATA\1102A\090F0101.D
 Reference used: C:\HPCHEM\1\DATA\1102A\095F0301.D

Recovery(%) : 47.7 found, 100% recovery assumed
 Resp. Factor : 1.365E-10 Threshold set : 100.0
 IBP : 317 F Start Elution : 0.00
 FBP : 1279 F End Elut. at : 44.56 Set

 Analysis results : %Weight versus Boiling point

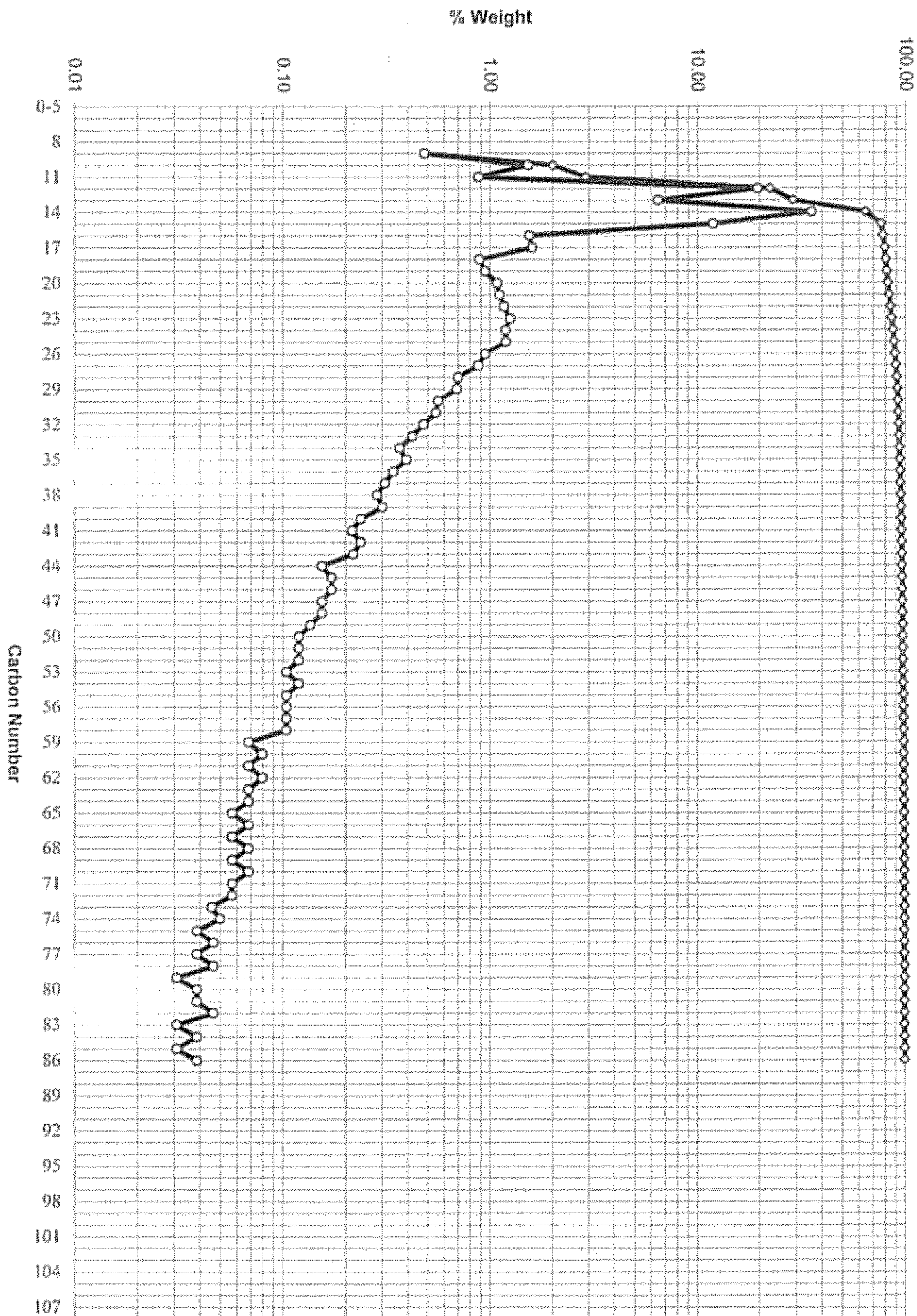
%	BP(F)	%	BP(F)	%	BP(F)	%	BP(F)
1	331	26	446	51	471	76	518
2	345	27	448	52	471	77	541
3	390	28	453	53	471	78	554
4	392	29	455	54	471	79	570
5	394	30	457	55	471	80	599
6	394	31	459	56	473	81	626
7	396	32	460	57	473	82	649
8	396	33	460	58	473	83	671
9	396	34	462	59	473	84	689
10	397	35	462	60	473	85	705
11	397	36	464	61	473	86	723
12	397	37	464	62	475	87	739
13	399	38	464	63	475	88	756
14	399	39	466	64	486	89	775
15	399	40	466	65	502	90	797
16	399	41	466	66	504	91	820
17	408	42	466	67	505	92	847
18	412	43	468	68	507	93	878
19	414	44	468	69	507	94	914
20	414	45	468	70	509	95	954
21	415	46	468	71	509	96	1000
22	415	47	469	72	511	97	1058
23	432	48	469	73	511	98	1126
24	441	49	469	74	513	99	1215
25	444	50	469	75	513		

=====

Analysis results : Table of cutpoints

BP(F)	%	BP(F)	%	BP(F)	%	BP(F)	%
360	2.1	750	87.6	1000	96.0		
480	63.9	800	90.2	1100	97.6		
650	82.1	900	93.6	1200	98.9		

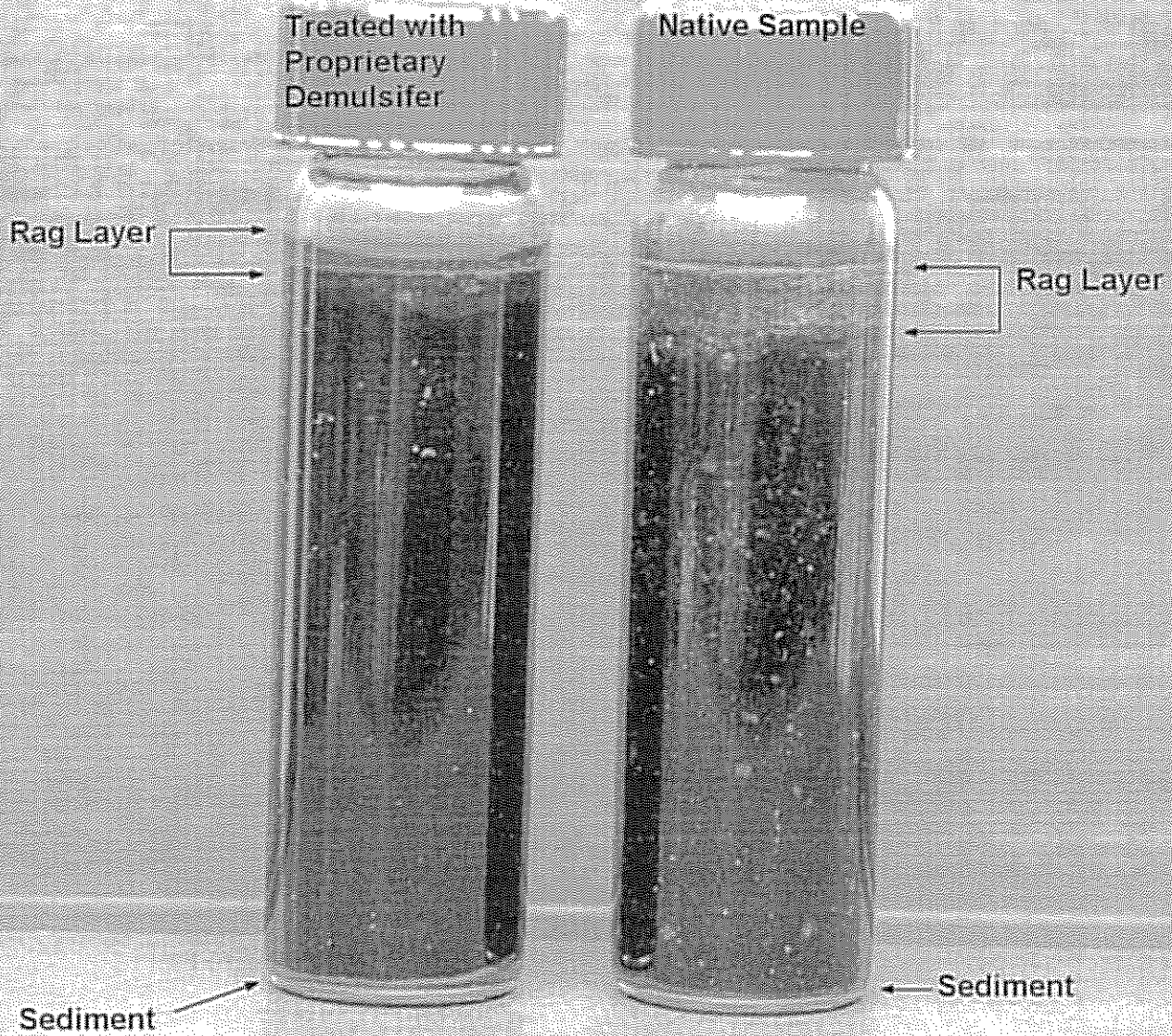
=====



Data File	C:\HPCHEM\1\DATA\1102A\005F0801.D											
Blank analysis	C:\HPCHEM\1\DATA\1102A\007F1001.D											
Calibration analysis	C:\HPCHEM\1\DATA\1102A\090F0101.D											
Reference analysis	C:\HPCHEM\1\DATA\1102A\095F0301.D											
Instrument name	SIMDIS_1											
Operator	Triton Analyt.		Seq. line nr									
Acquired on	11/3/1904 1:39		Injection									
Processed at	11/3/2004 15:30		Instrument									
Sample name	BR-INAPL1027		Vial									
Method name	MHC30.MTH		Weight sample		0.109 g							
Run type			1 Weight CS2		4.8569 g							
			Weight ISTD									
Sequence name	1102A											
Recovery %	47.7		found, 100% recovery assumed									
Response Factor	1.37E-10											
****Data Reduction Lookup Values ****												
Perc%	BP oC		BP F						Carbon Number	%wt Cum	%wt	Temp Eq Carbon#
0.5	158.2	316.8					0-5	0.00	0.00	97		
1	165.7	330.3					6	0.00	0.00	158		
2	173.9	345					7	0.00	0.00	208		
3	199.3	390.7					8	0.00	0.00	259		
4	200.2	392.4	0	0.5	0	316.8	9	0.48	0.48	304		
5	200.8	393.4	2	3	345	390.7	10	2.00	1.52	345		
6	201.3	394.3	2	3	345	390.7	11	2.88	0.88	385		
7	201.7	395.1	22	23	416.1	431.1	12	22.33	19.45	421		
8	202.1	395.8	28	29	452.8	455.7	13	28.76	6.43	455		
9	202.5	396.5	64	65	486	502.2	14	64.19	35.43	489		
10	202.8	397	76	77	518.7	541.9	15	76.06	11.87	520		
11	203.1	397.6	77	78	541.9	553.8	16	77.60	1.54	549		
12	203.4	398.1	79	80	570.6	599	17	79.19	1.59	576		
13	203.6	398.5	80	81	599	625.6	18	80.08	0.89	601		
14	203.9	399	81	82	625.6	649	19	81.02	0.94	626		
15	204.1	399.4	82	83	649	670.3	20	82.09	1.08	651		
16	204.3	399.7	83	84	670.3	689	21	83.20	1.10	674		
17	208.8	407.8	84	85	689	705.4	22	84.37	1.17	695		
18	211.1	412	85	86	705.4	722.7	23	85.61	1.25	716		
19	211.9	413.4	86	87	722.7	739.4	24	86.80	1.18	736		
20	212.5	414.5	87	88	739.4	756.3	25	87.98	1.19	756		
21	213	415.4	88	89	756.3	775.4	26	88.93	0.94	774		
22	213.4	416.1	89	90	775.4	796.1	27	89.80	0.88	792		
23	221.7	431.1	90	91	796.1	820	28	90.50	0.70	808		
24	227.4	441.3	91	92	820	846.9	29	91.19	0.69	825		
25	228.8	443.8	91	92	820	846.9	30	91.74	0.56	840		
26	229.7	445.5	92	93	846.9	878.5	31	92.29	0.54	856		
27	231.2	448.2	92	93	846.9	878.5	32	92.76	0.47	871		
28	233.8	452.8	93	94	878.5	914.2	33	93.18	0.42	885		
29	235.4	455.7	93	94	878.5	914.2	34	93.55	0.36	898		
30	236.4	457.5	93	94	878.5	914.2	35	93.94	0.39	912		
31	237.1	458.8	94	95	914.2	953.1	36	94.28	0.34	925		
32	237.7	459.9	94	95	914.2	953.1	37	94.59	0.31	937		
33	238.3	460.9	94	95	914.2	953.1	38	94.87	0.28	948		
34	238.7	461.7	95	96	953.1	999.7	39	95.17	0.30	961		
35	239.2	462.6	95	96	953.1	999.7	40	95.41	0.24	972		
36	239.6	463.3	95	96	953.1	999.7	41	95.62	0.21	982		
37	239.9	463.8	95	96	953.1	999.7	42	95.86	0.24	993		
38	240.3	464.5	96	97	999.7	1058.4	43	96.07	0.22	1004		
39	240.6	465.1	96	97	999.7	1058.4	44	96.23	0.15	1013		
40	240.9	465.6	96	97	999.7	1058.4	45	96.40	0.17	1023		
41	241.2	466.2	96	97	999.7	1058.4	46	96.57	0.17	1033		
42	241.5	466.7	96	97	999.7	1058.4	47	96.72	0.15	1042		
43	241.7	467.1	96	97	999.7	1058.4	48	96.87	0.15	1051		
44	242	467.6	97	98	1058.4	1125.9	49	97.01	0.13	1059		
45	242.2	468	97	98	1058.4	1125.9	50	97.13	0.12	1067		
46	242.5	468.5	97	98	1058.4	1125.9	51	97.25	0.12	1075		

47	242.7	468.9	97	98	1058.4	1125.9	52	97.36	0.12	1083
48	242.9	469.2	97	98	1058.4	1125.9	53	97.47	0.10	1090
49	243.2	469.8	97	98	1058.4	1125.9	54	97.59	0.12	1098
50	243.4	470.1	97	98	1058.4	1125.9	55	97.69	0.10	1105
51	243.6	470.5	97	98	1058.4	1125.9	56	97.79	0.10	1112
52	243.8	470.8	97	98	1058.4	1125.9	57	97.90	0.10	1119
53	244	471.2	98	99	1125.9	1214.1	58	98.00	0.10	1126
54	244.2	471.6	98	99	1125.9	1214.1	59	98.07	0.07	1132
55	244.4	471.9	98	99	1125.9	1214.1	60	98.15	0.08	1139
56	244.6	472.3	98	99	1125.9	1214.1	61	98.22	0.07	1145
57	244.7	472.5	98	99	1125.9	1214.1	62	98.30	0.08	1152
58	244.9	472.8	98	99	1125.9	1214.1	63	98.36	0.07	1158
59	245.1	473.2	98	99	1125.9	1214.1	64	98.43	0.07	1164
60	245.3	473.5	98	99	1125.9	1214.1	65	98.49	0.06	1169
61	245.4	473.7	98	99	1125.9	1214.1	66	98.56	0.07	1175
62	245.6	474.1	98	99	1125.9	1214.1	67	98.61	0.06	1180
63	245.8	474.4	98	99	1125.9	1214.1	68	98.68	0.07	1186
64	252.2	486	98	99	1125.9	1214.1	69	98.74	0.06	1191
65	261.2	502.2	98	99	1125.9	1214.1	70	98.81	0.07	1197
66	262.3	504.1	98	99	1125.9	1214.1	71	98.86	0.06	1202
67	263.2	505.8	98	99	1125.9	1214.1	72	98.92	0.06	1207
68	263.8	506.8	98	99	1125.9	1214.1	73	98.96	0.05	1211
69	264.4	507.9	99	99.5	1214.1	1279	74	99.01	0.05	1216
70	264.9	508.8	99	99.5	1214.1	1279	75	99.05	0.04	1221
71	265.4	509.7	99	99.5	1214.1	1279	76	99.10	0.05	1227
72	265.8	510.4	99	99.5	1214.1	1279	77	99.14	0.04	1232
73	266.2	511.2	99	99.5	1214.1	1279	78	99.18	0.05	1238
74	266.6	511.9	99	99.5	1214.1	1279	79	99.21	0.03	1242
75	266.9	512.4	99	99.5	1214.1	1279	80	99.25	0.04	1247
76	270.4	518.7	99	99.5	1214.1	1279	81	99.29	0.04	1252
77	283.3	541.9	99	99.5	1214.1	1279	82	99.34	0.05	1258
78	289.9	553.8	99	99.5	1214.1	1279	83	99.37	0.03	1262
79	299.2	570.6	99	99.5	1214.1	1279	84	99.41	0.04	1267
80	315	599	99	99.5	1214.1	1279	85	99.44	0.03	1271
81	329.8	625.6	99	99.5	1214.1	1279	86	99.48	0.04	1276
82	342.8	649	99.5	99.5	1279	1279	87			1279
83	354.6	670.3	99.5	99.5	1279	1279	88			1283
84	365	689	99.5	99.5	1279	1279	89			1287
85	374.1	705.4	99.5	99.5	1279	1279	90			1292
86	383.7	722.7	99.5	99.5	1279	1279	91			1295
87	393	739.4	99.5	99.5	1279	1279	92			1299
88	402.4	756.3	99.5	99.5	1279	1279	93			1302
89	413	775.4	99.5	99.5	1279	1279	94			1306
90	424.5	796.1	99.5	99.5	1279	1279	95			1310
91	437.8	820	99.5	99.5	1279	1279	96			1314
92	452.7	846.9	99.5	99.5	1279	1279	97			1317
93	470.3	878.5	99.5	99.5	1279	1279	98			1321
94	480.1	914.2	99.5	99.5	1279	1279	99			1324
95	511.7	953.1	99.5	99.5	1279	1279	100			1328
96	537.6	999.7	99.5	99.5	1279	1279	101			1331
97	570.2	1058.4	99.5	99.5	1279	1279	102			1334
98	607.7	1125.9	99.5	99.5	1279	1279	103			1337
99	656.7	1214.1	99.5	99.5	1279	1279	104			1340
99.5	692.8	1279	99.5	99.5	1279	1279	105			1343
			99.5	99.5	1279	1279	106			1346
			99.5	99.5	1279	1279	107			1349
			99.5	99.5	1279	1279	108			1351

BR-I (NAPL) 10/27/04



GSI Job No. G-2876
Issued: January 21, 2005



APPENDIX C.3 CHEMICAL COMPOSITION OF GROUNDWATER SAMPLE FROM WELL BR-G

C.3 Chemical Composition of Groundwater Sample from BR-G (one page)

C.3 CHEMICAL COMPOSITION OF GROUNDWATER SAMPLE FROM BR-G

On October 30, 2004, personnel from Groundwater Services, Inc. (GSI) attempted a DNAPL recovery test at well BR-G. No DNAPL could be recovered for laboratory analysis, but a groundwater sample was collected immediately prior to the conclusion of the DNAPL recovery test. Droplets of DNAPL were noted in the Waterra tubing when it was removed from BR-G at the conclusion of the recovery test.

The groundwater sample from BR-G was submitted to Severn Trent Laboratories in Savannah, Georgia, for laboratory analysis of VOCs and SVOCs. A copy of the laboratory report is attached. The following table lists all VOCs and SVOCs that were detected in this groundwater sample.

	Reported Concentration (mg/L)
VOCs by EPA 8260	
Benzene	0.076
Chlorobenzene	0.15
cis-1,2-Dichloroethene	0.011
trans-1,2-Dichloroethene	0.0041 J
MIBK	0.092 J
SVOCs by EPA 8270	
1,4-Dichlorobenzene	5.3
1,2,4-Trichlorobenzene	0.18 J
Phenol	0.24 J
2-Chlorophenol	0.035 J
4-Chloroaniline	0.12 J
J = Compound meets the identification criteria, but result is less than sample reporting limit and greater than the method detection limit.	

The presence of these constituents in the groundwater sample from BR-G may be due to dissolution of these constituents from DNAPL droplets in well BR-G. Alternatively, the VOCs and SVOCs detected in this groundwater sample could have originated from a location upgradient of well BR-G.